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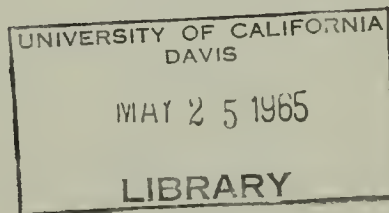


State of California
THE RESOURCES AGENCY
Department of Water Resources

BULLETIN No. 119-11

FEASIBILITY OF SERVING
THE TULARE LAKE BASIN
WATER STORAGE DISTRICT
FROM THE STATE WATER PROJECT

MAY 1965



HUGO FISHER
Administrator
The Resources Agency

EDMUND G. BROWN
Governor
State of California

WILLIAM E. WARNE
Director
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FOREWORD

In November 1960, the California Water Resources Development Bond Act was approved by the State's electorate, paving the way for the construction of the State Water Project as the first phase of the California Water Plan. Since that time, many local water service agencies throughout the State have contracted with the State for water service from the proposed facilities. Several water agencies have been organized since November 1960 expressly for the purpose of obtaining water supplies from the state facilities for the areas they represent.

Prior to executing water supply contracts with water agencies, the Department of Water Resources makes studies of the agencies and the areas encompassed by them to determine the propriety of entering into such contracts. These studies are made with the goal of evaluating (1) each area's future demand for supplemental water supplies, (2) the legal ability of each agency in question to enter into a water supply contract with the State, (3) the engineering feasibility of providing the proposed water service, and (4) the financial ability of the agency to contract for a water supply from the State Water Project.

The results of studies made for each agency, as described above, along with significant supporting material, are embodied in reports published by the Department of Water Resources. This bulletin is one of a series of such publications

and describes studies which led to the signing of a contract with the Tulare Lake Basin Water Storage District on December 20, 1963, and the amendments thereto, dated December 30, 1963, and September 28, 1964. The contract, as amended, provides for delivery of a maximum annual entitlement of 110,000 acre-feet of water from the California Aqueduct.

TABLE OF CONTENTS

	<u>Page</u>
FOREWORD.	iii
TABLE OF CONTENTS	v
ORGANIZATION, DEPARTMENT OF WATER RESOURCES	viii
ORGANIZATION, CALIFORNIA WATER COMMISSION	ix
 CHAPTER I. INTRODUCTION	 1
The Tulare Lake Basin Water Storage District	2
Powers of the District	3
General Powers	3
Powers to Contract	3
Fiscal Powers	3
The District's Service Area	4
Water Supply Available to San Joaquin Valley From the State Water Project	7
 CHAPTER II. POTENTIAL WATER DEMAND	 9
Agricultural Water Demand Factors	9
Classification of Land	9
Unit Use of Applied Agricultural Water	10
Market Outlook	11
Tentative Crop Pattern	11
Potential Water Requirement	12
Present Water Supply	13
Surface Water Supply	13
Ground Water Conditions	13
Safe Yield of Present Water Supplies	14
Potential Requirement for Imported Water	14

TABLE OF CONTENTS (Continued)

	<u>Page</u>
CHAPTER III. COST OF WATER SERVICE FROM THE STATE WATER PROJECT	15
Cost of State Water.	15
Cost of Entitlement Water	16
Delta Water Charge	16
Transportation Charge	18
Cost of Surplus Water	20
Surcharge	21
Surcharge Credit	22
Cost of Local Distribution	22
CHAPTER IV. DEMAND FOR PROJECT WATER . .	25
Payment Capacity of Crops.	25
Crop Yields	25
Prices Received	25
Crop Production Costs	26
Drainage.	26
Payment Capacity Determination	27
Economic Demand for Water.	27
Water Demand Buildup	30
CHAPTER V. FINANCIAL FEASIBILITY . . .	31
Financial Analysis	31
Water Toll	32
Assessed Valuation and Bonded Indebtedness. . . .	32
Financial Analysis Table.	32
Explanation of Column Headings in Table 6	34

TABLE OF CONTENTS (Continued)

	<u>Page</u>
CHAPTER VI. SUMMARY AND CONCLUSIONS . . .	37
Summary	37
Conclusions	40

TABLES

<u>Number</u>		
1	Classification of Irrigable Land in Tulare Lake Basin Water Storage District.	10
2	Unit Use Values of Applied Water for Crops Projected in Tulare Lake Basin Water Storage District	10
3	Tentative Crop Pattern in Tulare Lake Basin Water Storage District in 1990 Based on Consideration of Land Classification and Market Outlook	12
4	Summary of Annual Charges to Tulare Lake Basin Water Storage District for Water from the State Water Project	17
5	Estimated Annual Payment Capacities and Water Demand Schedule for Tulare Lake Basin Water Storage District	28
6	Financial Analysis, Tulare Lake Basin Water Storage District (Bound at the end of report)	

PLATES

(Plates are bound at the end of report)

<u>Number</u>	
1	Location of Tulare Lake Basin Water Storage District
2	Tulare Lake Basin Water Storage District
3	Water Cost-Demand Curve for Tulare Lake Basin Water Storage District

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

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CHAPTER I. INTRODUCTION

A contract between the State of California, Department of Water Resources, and the Tulare Lake Basin Water Storage District for a water supply from the State Water Project was signed on December 20, 1963, and amended December 30, 1963, and September 28, 1964. The contract, as amended, is for a maximum annual entitlement of 110,000 acre-feet of water. Presented in this report are data which demonstrate the need for and feasibility of the contract.

This chapter describes the history, economy, powers, and service area of the District. In the following chapters there are presented discussions of potential water demand, cost of water service from the State Water Project, and demand for project water considering the possible limiting effect of the cost of water. The report concludes with an analysis of the financial feasibility of the District's purchasing water from the State.

In the course of contracting negotiations with the District, there were available for consideration the Department of Water Resources' office report "Supplement to Information and Data on Proposed Program for Financing and Constructing State Water Facilities" dated May 1960; "Report and Estimate of Cost on Additional Project for Tulare Lake Basin Water Storage District to be Known as Additional Project No. 1" dated September 1963, published by the District; and the Department's Bulletin No. 3, "The California Water Plan". These reports provided the bases for negotiations, along with the prototype

water supply contract between the State and The Metropolitan Water District of Southern California; the "Standard Provisions for Water Supply Contract" approved August 3, 1962; and Bulletin No. 132-63, "The California State Water Project in 1963".

During 1963 several meetings were held with the directors and consulting engineer of the District. Several studies were made and presented by the Department to indicate estimated charges which would be made by the State to the District for water under different assumptions as to maximum annual entitlement, buildup of demand, and points of delivery.

The Tulare Lake Basin Water Storage District

The Tulare Lake Basin Water Storage District was organized on September 10, 1926. In July 1927 the Board of Directors of the District adopted the report "Amended Report and Estimate of Cost on Proposed Improvements of Tulare Lake Basin Water Storage District". In October of the same year the State Engineer of California approved the report, and later, in December, at an election held by the District, the land-owners of the District approved the plan. The State Engineer then certified that the report had been adopted. The report allocated money for such improvements as channel rectification, a storage reservoir in the District, levee protection, and the Pine Flat storage project. In the years since then, the District has been involved in projects to improve the distribution system in the District and has entered into agreements with other

associations for the purpose of dividing water from the Kings, Kern, Kaweah, and Tule Rivers.

The California Water Storage District Law is contained in Division 14, Sections 39000 through 48401, of the California Water Code. The code describes district powers and duties, and prescribes the procedures for district formation, organization, management, and financing.

Powers of the District

General Powers. The district may acquire, improve, and operate the necessary works for the storage and distribution of water and related drainage and reclamation (Section 43000).^{1/}

Powers to Contract. The district may enter into and perform any agreement with the United States, any state, county, district, public corporation, or municipality of any kind for a purpose related or beneficial to the district project (Section 43151). The district is given specific authority to contract with the State for a water supply (Sections 44000 et seq.). The district also is empowered to contract for water from the State Water Project by provisions of the Water Code governing the Central Valley Project (Sections 11102, 11625, and 11661), and to comply with the terms, provisions, and conditions of such a contract (Section 11662).

Fiscal Powers. The district may levy assessments on lands according to benefits (Sections 46150 et seq.), and may collect tolls and charges for the use of water and for

^{1/} All section references are to sections of the Water Code.

irrigation or available irrigation, and other services (Sections 43006, 43007, and 47180 et seq.).

General obligation bonds may be issued if approved by a majority of the votes cast by assessed landowners, or under certain circumstances by a two-thirds vote of the district governing board (Sections 45100 et seq.).

The District's Service Area

The service area of the Tulare Lake Basin Water Storage District consists of about 193,000 acres, or the entire District, which includes the Tulare Lake bed. Most of the land in the District is located in Kings County with a small part in Tulare County as shown on Plate 1, "Location of Tulare Lake Basin Water Storage District". The District, as shown on Plate 2, "Tulare Lake Basin Water Storage District", lies between Kettleman City on the west and Corcoran and Alpaugh on the east. It is bounded on the south by the Dudley Ridge and the Hacienda Water Districts, and on the north in part by the Empire West Side Irrigation District and Lemoore Canal and Irrigation Company.

Four rivers, the Kings, Kern, Kaweah, and Tule, as well as several smaller intermittent streams, drain toward the District. As a result, much of the land in the District has been covered at times with water to form Tulare Lake. A lake of varying size existed continuously from the year 1850, the first year of the lake's recorded history, until it went dry in 1899. Since then, there have been several periods during which the lake has been completely dry. These dry periods were

caused by reduced inflow due to a combination of below average precipitation and increased consumptive use of water for irrigation in the District and upstream therefrom. Occasionally, since farming of the lake area began, vast acreage has been flooded, resulting in both loss of crops and loss of the opportunity to plant crops. In 1938, for example, approximately 1,300,000 acre-feet of water poured into the lake. By July of that year, approximately 70 percent of the District was under water.

Today the four rivers which flow into the District are controlled to a considerable extent by dams which were constructed primarily for flood control. Despite the full use of these reservoirs for flood control during years of high water conditions, there will still be, in some years, floods beyond the capacities of the reservoirs to handle, and therefore much of the District's land could still go under water. The dams and accompanying reservoir capacities are tabulated below.

River	: Dams and Reservoirs : on Rivers Terminating in : Tulare Lake Basin W.S.D.	: Reservoir Capacity : at Normal Pool : in Acre-feet	: Year Put : into : Operation
Kings	Pine Flat	1,000,000	1954
Kern	Isabella	570,000	1954
Kaweah	Terminus	150,000	1961
Tule	Success	80,000	1961

The storage afforded by the four dams, in addition to providing valuable flood protection, makes it possible to regulate river flows so that more of the water is available when needed.

The economy of the District is based on irrigated agriculture. There has never been a significant permanent population within the District because of the danger of flooding. There are a few permanent residents in the higher elevations of the District and some camps for migrant farm workers which normally are occupied only part of the time. The nearest population center of any consequence is Corcoran, about four miles east of the District boundary. Little, if any, increase in urban development within the District is expected in the future since, in spite of the flood protection now afforded the area, much of the District could still go under water following a period of unusually high flows in the rivers.

According to a detailed land use survey made by the Department in 1958, there were 153,400 acres of irrigated land in the District. This total includes 125,100 acres of crops and 28,300 acres of land ordinarily irrigated but fallow in 1958. The primary crops were barley, cotton, and alfalfa in order of the acreage planted. There were also 181 acres of dry-farmed land in the District.

The climate of the District is characterized by hot dry summers and cool winters, with low annual rainfall. Although no climatological data have been published by the U. S. Weather Bureau for locations in the District, the following characteristics have been estimated from other available records. The average annual rainfall is about six inches. Most of the precipitation occurs from November through March. In July, the hottest month, the average maximum temperature is about 99°

Fahrenheit; and in January, generally the coldest month, the average minimum temperature is about 34° Fahrenheit. Ground or tule fogs are common during winter months and occasionally persist for days or weeks.

Most of the lands of the District are smooth-lying, with elevations ranging from about 180 feet to 200 feet.

Water Supply Available to San Joaquin
Valley From State Water Project

The California Water Commission has assigned certain state applications for appropriation of water to the Department for the operation of the State Water Project. The applications showed, as of December 1963, that 1,547,000 acre-feet of the water appropriated were available for use in the San Joaquin Valley.^{2/}

As of mid-December 1963, when the water supply contract between the State and the Tulare Lake Basin Water Storage District was in the final negotiation stage, the only San Joaquin Valley contract which had been consummated was that with Kern County Water Agency for 1,000,000 acre-feet. Other San Joaquin Valley contracts under consideration totaled 127,500 acre-feet. Thus, ample water for annual entitlements was available for contracting with the District.

^{2/} Included 36,000 acre-feet reserved for San Joaquin Valley but not to be transferred from South Bay and Central Coastal allocations until needed, and 36,000 acre-feet transferred from North Bay and Feather River allocations to an unallocated pool held in reserve for San Joaquin Valley when and if needed and for any other area of the State if not required in the San Joaquin Valley.

In addition to annual entitlements under water supply contracts, surplus water will be available from the project. The amounts of surplus water assumed to be delivered to the District on an irrigation demand schedule are shown in column 3 of Table 6, "Financial Analysis, Tulare Lake Basin Water Storage District" (bound at end of report).

CHAPTER II. POTENTIAL WATER DEMAND

Presented in this chapter are discussions of the factors affecting agricultural water demand and an estimate of the potential water demand in the Tulare Lake Basin Water Storage District based on a consideration of land classification, unit water use, and market outlook, but disregarding the cost and availability of water. The latter are considered in Chapters III and IV.

Presented first are land classification data, estimates of unit water requirements, and a discussion of market outlook. These are followed by a determination of the potential requirement for water and an analysis of the present water supply conditions. The chapter concludes with a determination of the potential requirement for imported water calculated as the difference between the potential water requirement and the present water supply.

As stated in Chapter I, it is not anticipated that significant urban development will occur in the District. Therefore, the entire potential demand determined herein is for agricultural use.

Agricultural Water Demand Factors^{1/}

Classification of Land

A land classification survey was conducted by the Department of Water Resources in the San Joaquin Valley during the period 1956-61. Table 1, "Classification of Irrigable Land in Tulare Lake Basin Water Storage District", is based on data obtained from that

^{1/} For additional information concerning these factors, see "Appendix to Final Report, General Evaluation of the Proposed Program for Financing and Constructing the State Water Resources Development System of the State of California, Department of Water Resources", October 1960, by Charles T. Main, Inc.

survey. In addition to the 188,703 acres of irrigable land as shown in Table 1 there are 4,764 acres of non-irrigable land in the District.

TABLE 1

CLASSIFICATION OF IRRIGABLE LAND IN TULARE
LAKE BASIN WATER STORAGE DISTRICT
(In gross acres)

Valley Land	:	Valley Land	:	Valley Land	:	
of Excellent	:	of Medium	:	of Poor	:	
Quality ^{1/}	:	Quality ^{2/}	:	Quality ^{3/}	:	Total
15,276		155,285		18,142		188,703

^{1/} Land classified as Vs.

^{2/} Land classified as Vls and Vps.

^{3/} Land classified as Vss, Vhss, Vpss, Vsa, Vpsa, and Vhsa.

NOTE: For definitions of land classification symbols see Department of Water Resources' "Report on Proposed Belridge Water Storage District, Kern County", December 1961.

Unit Use of Applied Agricultural Water

Estimated values of unit use of applied water for crops projected in the Tulare Lake Basin Water Storage District are tabulated in Table 2, "Unit Use Values of Applied Water for Crops Projected in Tulare Lake Basin Water Storage District".

TABLE 2

UNIT USE VALUES OF APPLIED WATER FOR CROPS PROJECTED IN
TULARE LAKE BASIN WATER STORAGE DISTRICT

	:	Acre-feet of Water
	:	per Acre of Irrigated
Crop	:	Land
Alfalfa		3.9
Barley		1.1
Cotton		3.8
Miscellaneous field		2.0
Miscellaneous truck		2.4
Pasture		3.9

Market Outlook

In an office study prepared in 1958 entitled "Market Outlook for Selected California Crops, 1960-2020", the Department estimated future demand for specialty farm products grown in California. That study was used as a guide, together with other criteria, in estimating the District's share of the total California 1990 market for specialty farm crops. This determination took into consideration historical shifts in the production of crops among different producing areas in California. The historical regional crop production shifts for the past 40 years were plotted and projected to 1990.

Tentative Crop Pattern

From the market outlook study for specialty crops and estimated 1990 crop yields, the acreage necessary to supply the market demand for specialty crops in the District was determined. A tentative crop pattern was prepared for this acreage and for the remaining acreage of the District on which non-specialty crops would be grown.

The 1990 tentative crop pattern in the District is shown in Table 3, "Tentative Crop Pattern in Tulare Lake Basin Water Storage District in 1990 Based on Consideration of Land Classification and Market Outlook". The acreage shown therein is the net acreage in the District after making reductions in the gross areas reported in the land classification table for the portions of the irrigable land that would be occupied by farm lots, highways, canals, etc.

TABLE 3

TENTATIVE CROP PATTERN IN
TULARE LAKE BASIN WATER STORAGE DISTRICT
IN 1990 BASED ON CONSIDERATION OF
LAND CLASSIFICATION AND MARKET OUTLOOK
(In net acres)

Crop	:	Acres
Alfalfa		16,000
Barley		68,600 ^{1/}
Cotton		43,800
Miscellaneous field		34,400 ^{2/}
Miscellaneous truck		1,600
Pasture		1,600
Total		166,000

^{1/} Of this amount 4,500 acres are double cropped.

^{2/} Of this amount 3,400 acres are double cropped.

Potential Water Requirement

There is an estimated potential water requirement of about 395,000 acre-feet annually in the Tulare Lake Basin Water Storage District. This amount is the sum of the products of the crop acreages in Table 3 and the appropriate unit use values of applied water in Table 2. The determination of this quantity is based on consideration of the previously described agricultural water demand factors, but disregards the economic factor of water cost and the availability of water. As is indicated in Chapter I, there was plenty of water available from the State Water Project to supply the needs of the District; therefore, availability was no constraint on the water demand. The effect of water cost on demand for water is considered in Chapter IV.

Present Water Supply

Surface Water Supply

Surface water has been obtained by the District from the Kings, Kern, Kaweah, and Tule Rivers, with the principal supply from the Kings River. Pacts have been entered into by the District for the diversion of waters of the Kings and Kern Rivers. The quantity of water from these sources varies considerably from year to year. In a wet year, which occurs approximately once in five years, it will be difficult for the District to accept state water. The State has agreed to work with the District to avoid financial loss to the District on account of its inability to accept project water in years when runoff is above normal in the watersheds tributary to Tulare Lake Basin.^{2/} Other surface water available to landowners in the District is obtained from private canal systems through stock ownership. These canal systems include Peoples Ditch, Lakeland Canal, and Last Chance Ditch. The District has estimated that the average surface water supply for use on land in the District is 179,000 acre-feet a year.

Ground Water Conditions

The District does not own any wells, but there are some privately owned wells used in the District. The major supply of ground water used in the District, however, is imported from private well fields east of the District. Water levels in

^{2/} Article 45(f) of contract between Tulare Lake Basin Water Storage District and the State dated December 20, 1963.

these wells show wide fluctuations. During seasons when pumping is heavy, because of limited surface water supplies, water levels drop rapidly, but in seasons when pumping is light, because of above average surface water supplies, the water levels rise. Overall there is a general downward trend in the water levels indicating that extraction of ground water exceeds replenishment. It is estimated that the safe ground water yield for use in the District approximates 75,000 acre-feet a year.

Safe Yield of Present Water Supplies

The total safe yield of the existing local surface and ground water supplies available to the Tulare Lake Basin Water Storage District, as described above, is estimated to be 254,000 acre-feet annually. This is the amount which could be obtained annually for an indefinitely long period of years.

Potential Requirement for Imported Water

By deducting the estimated safe yield of the present water supply from the previously determined potential water requirement, the potential requirement for imported water in the District is determined to be 141,000 acre-feet annually.

CHAPTER III. COST OF WATER SERVICE FROM THE STATE WATER PROJECT

The cost to the Tulare Lake Basin Water Storage District for water service from the State Water Project is dependent upon the allocation to the District of its share of the cost of project conservation and transportation plus the cost of local conveyance and distribution of water. The State Water Project will be constructed by the State primarily with funds provided under terms of the Water Resources Development Bond Act.^{1/} The local conveyance facility and distribution system will be provided by the District.

The procedure for determination of the District's share of project costs is set forth in the State's water supply contract with the District. Articles 1 through 44 of the contract set forth certain standard provisions generally applicable to all contracts. Article 45 sets forth such specific provisions or modifications of the standard provisions as are expressly applicable only to Tulare Lake Basin Water Storage District.

Cost of State Water

Under terms of the Department's water supply contracts, each contracting agency will be charged for such quantities of project water as it is entitled to receive each year. In addition, charges will be made for surplus water which will be available to each agency under certain conditions.

^{1/} Chapter 8, commencing with Section 12930, of Part 6 of Division 6 of the Water Code.

Cost of Entitlement Water

Charges under the contracts are made to secure payment of reimbursable costs of the project conservation works and project transportation facilities necessary to deliver water. Charges for these purposes are called, respectively, the Delta Water Charge and the Transportation Charge.

Delta Water Charge. Under the provisions of Article 22^{2/} every contractor for project water will pay the Delta Water Charge as an annual charge per acre-foot of project water included within its annual entitlement for the respective year. This charge, together with revenues derived from power generated in connection with the operation of project conservation facilities, will return to the State all reimbursable costs of the conservation facilities over the project repayment period.

The Delta Water Charge is established at a rate of \$3.50 per acre-foot through the year 1969, and is estimated to be \$5.46 per acre-foot for the period 1970 through 1977 and \$7.34 per acre-foot thereafter until supplemental conservation facilities, as defined in the standard provisions, are constructed. Estimated charges for this component for the demand buildup included in the contract with the District are included in Table 4, "Summary of Annual Charges to Tulare Lake Basin Water Storage District for Water from the State Water Project".

2/ All article references are to articles of the "Water Supply Contract Between the State of California and Tulare Lake Basin Water Storage District" dated December 20, 1963.

TABLE 4

SUMMARY OF ANNUAL CHARGES TO TULARE LAKE BASIN
WATER STORAGE DISTRICT FOR WATER FROM THE STATE WATER PROJECT
(In dollars unless otherwise stated)

: :	
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Transportation Charge. In addition to the Delta Water Charge, contractors receiving water from the State Water Project will pay for the construction and operation of the transportation facilities. Articles 23 through 28 of the State's water supply contracts govern the determination of the transportation charge.

The allocation to each contractor of costs comprising the three components of the transportation charge is made on a proportionate-use-of-facilities basis. The capital cost and the minimum, or fixed, operation, maintenance, power, and replacement costs are allocated on the basis of the maximum annual entitlement and peaking capacity provided for the contractor within each reach of the aqueduct that would be used to convey water to the contractor. The variable operation, maintenance, power, and replacement costs are allocated on the basis of the contractor's share of water delivered through each reach of the aqueduct during each year.

The project transportation facilities that would be used to provide water to the Tulare Lake Basin Water Storage District are the portions of the California Aqueduct from the Sacramento-San Joaquin Delta to the junction with the Coastal Aqueduct. The elevation of the water surface in the California Aqueduct is approximately 318 feet at the District's northernmost proposed turnout near Huron and approximately 310 feet at the southernmost proposed turnout near Avenal Gap.

The total transportation capital cost allocated to the District is estimated to be \$8,377,900 for a maximum annual

entitlement of 110,000 acre-feet at a maximum monthly peaking rate of 18 percent.

Under the standard method of payment set forth in Article 24(c) of the contract, the construction, or capital, cost component of the transportation charge allocated each year to a contractor would be paid in 50 equal annual payments of principal and interest. Payment at a unit rate per acre-foot of water delivered which will repay all costs with interest during the project repayment period is a permissible modification of the method set forth in Article 24(c), and is the method of payment provided for in Article 45(c) of the District's contract. The unit rate is estimated to be \$4.94 per acre-foot for the annual entitlement set forth in the District's contract. Payment at this rate commencing in the initial year of water delivery will repay all principal and interest, at the project interest rate compounded annually, of estimated project transportation capital costs allocated to the District within the project repayment period. The project interest rate will depend upon the actual interest rates for bonds to be sold under the Water Resources Development Bond Act. The project interest rate is assumed herein to be four percent per annum.

Estimated annual values of the components of the Transportation Charge for deliveries to the District are shown in Table 4.

The determination of charges under the contract, as described above and as summarized in Table 4, does not result in a uniform charge per acre-foot of entitlement water throughout

the repayment period. Since major portions of the total charge are on a unit rate basis, however, the total charge is fairly uniform. Equivalent unit rates of components of the total charge have been computed for the purposes of comparison. These are shown in Table 4. The equivalent unit rate is defined as that constant charge which, when assessed against each acre-foot of delivery during the entire repayment period, will produce an amount by the end of the period equivalent to the sum of the annual charges which would have been assessed under the method set forth in Article 24(c), together with interest computed at the project interest rate. The total estimated equivalent unit rate for service for annual entitlements to the District is \$16.59 per acre-foot at canalside as shown in Table 4.

Cost of Surplus Water

Article 21 of the contract provides that if during any year the supply of project water, after appropriate allowance for holdover storage, exceeds the total of annual entitlements of all contractors for that year, the State shall offer to sell and deliver such surplus water for periods expiring not later than the end of such year. The article also provides that the charge for surplus water shall be at least equal to the variable operation, maintenance, and power costs incurred in service for such water. This would include variable charges for both the conservation and transportation facilities.

Article 21 is modified by Article 45(a)^{3/} to provide that surplus water will be allocable to the District for

3/ As amended September 28, 1964.

agricultural and ground water replenishment use on the basis of the amount of entitlement water it so uses. Such surplus water will be furnished at prices which will return to the State the variable operation, maintenance, power, and replacement components of the Delta Water Charge and Transportation Charge incurred in the service of such water. Contracts made pursuant to such modification of Article 21 may exceed one year in duration. Contractors in the San Joaquin Valley service area, including the Tulare Lake Basin Water Storage District, will have a right to contract for 69 percent of the surplus water available at the Mile 18 Pumping Plant.

The unit rate for surplus water which could be supplied for agricultural and ground water replenishment use in Kings County is estimated to range from \$3 to \$4 per acre-foot. It is estimated that surplus water will be available to the District on an irrigation demand schedule through 1981. The equivalent unit rate for delivery of combined project water to meet annual entitlements and surplus water is about \$14.60 per acre-foot over the repayment period for the contracted annual entitlements shown in column 2 and the assumed deliveries of surplus water shown in column 3 of Table 6.

Surcharge

A surcharge equivalent to the power credit per acre-foot of water will be made for project water put to agricultural or manufacturing use on excess land. This surcharge is provided for in Article 30 of the standard contract provisions, and is established as \$2 per acre-foot until all of the facilities for

generation of electrical energy in connection with the operation of initial project conservation facilities are installed and in operation. Each year thereafter the State shall redetermine the power credit per acre-foot of water. Excess land is defined as that part of any land in excess of 160 acres in single beneficial ownership, or 320 acres in joint ownership by husband and wife. The surcharge would be applicable to surplus water and to project water delivered under the District's annual entitlement.

Surcharge Credit

Under terms of Article 45(b), the State may allow a credit to the contractor, not to exceed the surcharge to be paid by such contractor, which credit shall be utilized to reduce the cost of water for agricultural use on other than excess land at a uniform rate not to exceed \$2 per acre-foot.

Cost of Local Distribution

The Tulare Lake Basin Water Storage District has in existence an extensive system of canals, ditches, control structures, and levees. With some improvements, this system can be utilized by the District for distribution of project water to be delivered from the California Aqueduct. The District has estimated it will spend \$1,000,000 to improve the existing distribution system.

A locally constructed and financed conveyance facility will be required to convey water from the California Aqueduct to the District's existing distribution system. The District is favorably located to receive state water since all of the District

lies below the aqueduct. The aqueduct is about one and one-half miles west of the District at the closest point.

A preliminary design for a conveyance facility has been made for the purpose of estimating costs for conveying water from the California Aqueduct to the District. Three turnout locations, as shown on Plate 2, have been tentatively selected. The northernmost conduit would be approximately 12 miles in length and would deliver water to the Kings River at a point in the vicinity of Empire Weir No. 2. Another conduit would take water from a point near Kettleman City and deliver it to the Blakeley Canal, a distance of approximately one and one-half miles. The southernmost conduit, approximately eight miles in length, would deliver water to the southern rim of the District. The three turnouts are designed to provide the capacity requested by the District.

It is assumed that the northernmost conduit would be a canal to convey water from the aqueduct to the Kings River. The canal will be concrete-lined with a capacity of 165 second-feet. The District plans to take delivery through this canal of 33,000 acre-feet per year of the maximum annual entitlement of 110,000 acre-feet.

The Kettleman City conduit would be a reinforced concrete pipeline from the aqueduct to the Blakeley Canal. The capacity of the conduit would be 140 second-feet and would be used to deliver 28,000 acre-feet per year.

The southernmost conduit would be a concrete-lined canal designed with a capacity of 245 second-feet and would be used to deliver 49,000 acre-feet per year.

Cost estimate of construction of the conveyance facility is based on unit cost data adjusted to reflect 1963 prices. The estimated capital cost for the conveyance facility and the cost of improvements to the existing distribution system total \$3,218,000. It has been assumed the capital cost would be repaid by the end of a 40-year period commencing in 1968. From then on, the total annual cost would include only the operation, maintenance, and replacement costs. Column 14 of Table 6 shows the total annual local distribution and conveyance costs.

The above estimate does not include the cost for turnout structures which must be paid to the State prior to their construction. The capital cost of the District's three turnout structures is estimated to be about \$182,000.

The total estimated cost, including the capital cost, operation, maintenance, and replacement costs of both the distribution system and the conveyance facility, on an equivalent unit rate basis, is \$3.87 per acre-foot over the 40-year repayment period or \$3.61 over the 68-year State Water Project repayment period. The latter amount consists of \$1.95 per acre-foot for repayment of the capital cost and \$1.66 per acre-foot for operation, maintenance, administration, and replacement costs.

CHAPTER IV. DEMAND FOR PROJECT WATER

Presented in this chapter are the relevant economic factors and data used to determine project water demand, an estimate of the demand, and a determination of the buildup of demand in the Tulare Lake Basin Water Storage District. The purpose of studying these matters was to determine to what extent the farming of land in the District could support the purchase of the "potential requirement for imported water" which was developed in Chapter II.

Payment Capacity of Crops

In this report, payment capacity is defined as the amount which is available from gross crop revenues to pay water costs after deducting all other farm production expenses. The appraisal of crop payment capacity per acre-foot of water involves the consideration of crop yields, prices received, crop production costs, and other factors related thereto. These factors are briefly discussed and a payment capacity determination is presented in the following paragraphs.

Crop Yields

Crop yields used in this payment capacity analysis were developed following review of Kings County agricultural reports and conferences with local authorities. The adopted yields are believed to be conservative.

Prices Received

The prices of farm products used in this analysis are essentially the averages of prices received by Kings County farmers during the 1952-56 period. This information was obtained from the

Agricultural Commissioner's reports and conferences with local authorities.

Crop Production Costs

Crop production costs are computed on a per acre basis, using the estimated average unit prices paid during the 1952-56 period for the factors of production, including interest, taxes, and wages. These unit prices are applied to all labor and materials, except water, used in production; cash overhead, such as taxes, repairs, and general expenses; all interest and depreciation; and management charges.

In addition, the crop production costs include an allowance for occasional losses attributable to inclement weather and adverse market conditions.

Drainage

Although there is no surface outflow from the District at present, there is little doubt that outflow must be provided in the future in order to prevent salts from accumulating in the soil in amounts that will inhibit plant growth. Harmful salts will have to be carried out of the District in drainage water. The crop pattern presented in Chapter II was projected on the assumption that sufficiently well drained soil would be available to permit normal development of crop root systems. Costs of providing farm drainage systems were not included in the crop production costs, but it is believed the District could provide adequate drainage facilities at a cost which would not affect the conclusions reached herein. The District has completed a drainage study and plans to construct a drainage system in the near future.

Payment Capacity Determination

Estimated crop production costs on a per-acre basis for each of the projected crops shown in Table 3, excluding cost of water, were deducted from the gross income values derived from crop yields and prices received, to establish the payment capacity per acre of each crop. Payment capacities at the farm headgate for the projected crops are shown in Table 5, "Estimated Annual Payment Capacities and Water Demand Schedule for Tulare Lake Basin Water Storage District".

Most of the data used in the payment capacity determination have been derived from the Department's office report entitled "Supplement to Information and Data on Proposed Program for Financing and Constructing State Water Facilities" dated May 1960.

Economic Demand For Water

In this report a water demand schedule is defined as a catalogue of quantities of water that will be purchased at various possible prices at a given time. Such a schedule indicates the relationship of demand for water to cost of water and is presented here in tabular form and as a water cost-demand curve.

A water demand schedule is based on the principle that as the price of water decreases the demand for water increases and, conversely, as the price increases the demand decreases. This difference in demand occurs because different crops possess different abilities to pay for water, different lands have different abilities to grow crops, and operators with sunk investments vary from other operators in their willingness to pay for water. Some crops, such as grapes, truck, cotton, and deciduous fruit and nuts have greater

TABLE 5

ESTIMATED ANNUAL PAYMENT CAPACITIES AND WATER DEMAND
SCHEDULE FOR TULARE LAKE BASIN WATER STORAGE DISTRICT

Crop	: Projected Crop Acreage: Water Requirement :			: Cumulative		
	: in 1990 on Presently :	(In acre-: (In acre-: Payment Capacity:	Water	: Requirement	: (In acre-feet)	
	: Developed Land	: feet per: feet) : (Per acre-foot) :				
	: (In acres)	: acre) :				
Miscellaneous truck	1,600	2.4	3,840	\$ 37.10	3,840	
Cotton	43,800	3.8	166,440	33.20	170,280	
Barley	68,600	1.1	75,460	20.90	245,740	
(double crop)	(4,500)	1.1	4,950	20.90	250,690	
Miscellaneous field	34,400	2.0	68,800	20.00	319,490	
(double crop)	(3,400)	2.0	6,800	20.00	329,290	
Alfalfa	16,000	3.9	62,400	10.30	388,690	
Pasture	<u>1,600</u>	3.9	<u>6,240</u>	9.00	394,930	
TOTAL	166,000		394,930			

Note: Amounts in parentheses indicate double cropped acreage grown in fall-winter-spring irrigation season.

abilities to pay for water than crops such as grain, alfalfa, and miscellaneous field crops. Farm operators will normally grow only those crops which, as a minimum, return all the variable costs of production. Consequently, where only high-cost water is available, crops with higher payment capacities would be grown, but with the availability of low-cost water a larger amount of water would be purchased to irrigate crops with both high and low payment capacities.

The payment capacities of the various crops tentatively projected in the District have been arrayed by magnitude in Table 5. Values in this table were used to plot the curve shown on Plate 3, "Water Cost-Demand Curve for Tulare Lake Basin Water Storage District".

The weighted average unit cost of the present irrigation supply and the future supply of state water has been determined for the purpose of utilizing the water cost-demand curve. It has been assumed that ground water would cost \$12.00 per acre-foot, local surface water would cost \$4.00 per acre-foot, and the District would charge the rates for water from the State shown in columns 5 and 7 of Table 6, "Financial Analysis, Tulare Lake Basin Water Storage District". These rates for state water average about \$18.00 per acre-foot for delivery of water to farm headgates. The weighted average unit cost for 75,000 acre-feet of ground water, 179,000 acre-feet of local surface water, and 141,000 acre-feet from the California Aqueduct is \$10.50 per acre-foot. With this water cost, the water cost-demand curve

indicates there would be an economic demand for about 385,000 acre-feet of water annually.

Since 254,000 acre-feet of the amount is expected to be supplied by the present water supply, the estimated 1990 economic demand for water from the State Water Project in the District is 131,000 acre-feet. The District has contracted for a water supply of 110,000 acre-feet annually from the State Water Project.

Water Demand Buildup

In this report the District's request for water demand buildup was used. It is believed that the District can utilize water at this rate. The necessary distribution system for the District is already installed. The imported water will supplement that available from other sources to permit a more stable crop pattern. The projected rate of demand buildup for entitlement water to the 1990 quantity is presented in column 2 of Table 6. The amounts of surplus water assumed to be delivered on an irrigation demand schedule are shown in column 3 of Table 6.

CHAPTER V. FINANCIAL FEASIBILITY

The previous chapter indicates there is an estimated economic demand for 131,000 acre-feet of state water in addition to the present supply of 254,000 acre-feet to irrigate land in the Tulare Lake Basin Water Storage District. As previously indicated the District has contracted for a maximum annual entitlement of 110,000 acre-feet. Presented in this chapter is an analysis which demonstrates the feasibility of a plan for the payment by the District of the long-term debt which must be undertaken to purchase water under the contract and deliver the water to the users' headgates.

Although the cost of the water to the District will be relatively high, it is shown in Table 6, "Financial Analysis, Tulare Lake Basin Water Storage District", that the District will not be unduly burdened by its debt incurred for purchase, conveyance, and distribution of water during the project repayment period.

The analysis indicates that the District can meet, on a year-to-year basis, the cost of project water and the cost to convey and distribute the water to the land. It is believed that the information presented herein justifies the contract between the State and the District.

Financial Analysis

The various factors entering into the financial analysis are discussed in the following paragraphs. The analysis is presented in Table 6 which appears at the end of the report.

Water Toll

A water toll method of recovering water costs has been utilized in this analysis. Assumed District water tolls for annual entitlements and surplus water are shown in columns 5 and 7 of Table 6. Water tolls ranging between \$17.50 and \$19.75 an acre-foot have been employed in such a way as to allow total revenues to equal total costs by the end of 1999. It will be noted in the analysis that no revenue from the sale of surplus water is assumed after 1981. Some surplus water would probably be available at off-peak times after that year, but it is assumed it would be sold at or near cost. Costs and tolls would therefore remain in balance.

Assessed Valuation and Bonded Indebtedness

The 1962-63 assessed valuation of lands within the District was about \$8,490,000. The bonded indebtedness assignable to the District area was \$248,000. The bonded indebtedness is thus 2.9 percent of the assessed valuation.

Financial Analysis Table

Presented in Table 6 is a year-by-year summary of the assumed revenues from sale of water by the District; the costs which would be charged to the District by the State for annual entitlements and surplus water; the costs which would be incurred by the District for conveyance and distribution of state water; the difference between revenues and costs or the net operating revenues; and the balance of funds remaining at the end of the year.

The capital cost for turnout structures and measuring devices from the California Aqueduct must be paid prior to the start of construction. It is estimated that this cost will be \$182,000, which will be due in 1966. In this analysis, it has been assumed that the District would pay this cost in a lump sum financed from a short-term loan.

During the early years of the project, substantial amounts of revenue in excess of cost are generated. These excess revenues accumulate by 1981 to a maximum of \$3,349,800, including interest at four percent. Thereafter, the year-end balance is reduced to zero by 1999 and remains so throughout the repayment period.

Although the net revenues are assumed to accumulate interest during the early years of the project, these funds might be used to finance partially the construction of the conveyance facility.

The financial analysis contains many assumptions on matters which are the province of the Board of Directors of the Tulare Lake Basin Water Storage District. It is believed, however, that the assumptions employed herein are sufficiently representative to demonstrate that not only is the suggested program financially feasible, but that it would remain so with reasonable variation in the assumptions.

An explanation of the column headings of the financial analysis table follows:

Explanation of Column Headings in Table 6

<u>Column Number</u>	<u>Explanation</u>
1	Years of the period of analysis commencing in year 1966, the year in which payment for the turnout structures and measuring devices is assumed to be made, and terminating in 2035, the assumed end of 50-year repayment period following final project construction.
2	Delivery of annual entitlement water. The total demand and the rate of demand buildup are those negotiated by the Department and the District, and appear in Table A of the contract between the District and the State.
3	Annual delivery of surplus water on an irrigation demand schedule. Its use terminates after 1981, the estimated last year of availability of such surplus water.
4	Total annual delivery to the District. (Sum of columns 2 and 3.)
5	Assumed tolls for entitlement water to all users in the District at farm headgate.
6	Total revenue from delivery of annual entitlements of water. (Product of columns 2 and 5.)
7	Assumed tolls for surplus water to all users in the District at farm headgate.
8	Total annual revenue from delivery of surplus water on an irrigation demand schedule. (Product of columns 3 and 7.)

Explanation of Column Headings in Table 6 (Continued)

Column
Number

Explanation

- | | |
|----|---|
| 9 | Total annual revenue from delivery of both types of water. (Sum of columns 6 and 8.) |
| 10 | Annual repayment requirements for annual entitlements delivered at canalside to be paid to the State on a unit rate basis allowed under provisions of Article 45 of the contract. |
| 11 | Cost per acre-foot of delivering surplus water at canalside on an irrigation demand schedule. |
| 12 | Total annual cost of delivering surplus water at canalside on an irrigation demand schedule. (Product of columns 3 and 11.) |
| 13 | Total annual cost of delivering both types of water at canalside. (Sum of columns 10 and 12.) |
| 14 | Total annual local conveyance and distribution costs based on peak demand of 18 percent and 40-year repayment period at five percent interest. |
| 15 | Total annual cost of delivering both types of water to the farm headgate. (Sum of columns 13 and 14.) |
| 16 | Difference between cost of delivering both types of water to the farm headgate and estimated revenue received by the District from the sale thereof. (Column 9 less column 15.) |
| 17 | Balance of available funds from previous year plus net operating revenue collected in current year. (Sum of column 19 of previous year and column 16 of current year.) |

Explanation of Column Headings in Table 6 (Continued)

<u>Column Number</u>	<u>Explanation</u>
18	Interest earning on balance of District funds. (Product of 0.04 and column 17.)
19	Balance of funds available to District at end of each year. (Sum of columns 17 and 18.)

CHAPTER VI. SUMMARY AND CONCLUSIONS

The pertinent information presented in this report is summarized and conclusions are presented in the following sections.

Summary

1. The Tulare Lake Basin Water Storage District, comprising about 193,000 acres in Kings and Tulare Counties, was officially organized in 1926. It may contract with the State for a water supply, construct and operate conveyance and distribution facilities to deliver said supply, and obtain funds by water charges and by assessment of land according to benefits.

2. The economy of the District is based primarily on irrigated agriculture. In 1958 there were about 153,400 acres of irrigated land in the District. This total includes 125,100 acres of crops and 28,300 acres of land ordinarily irrigated but fallow in 1958.

3. The California Water Commission, as of December 1963, allocated 1,547,000 acre-feet of water from the State Water Project to the San Joaquin Valley, including 72,000 acre-feet reserved for the valley from other allocations if needed. At the time final negotiations of a water supply contract between the State and the District were in progress in December 1963, 1,000,000 acre-feet of this total had been contracted for and other contracts for about 127,500 acre-feet were under negotiation. Thus, ample water for annual entitlements was available for contracting with the District.

4. There is a potential water requirement of about 395,000 acre-feet annually in the District. The determination of this quantity is based on the consideration of agricultural water demand factors but disregards the availability and cost of water.

5. Surface water is obtained by the District from the Kings, Kern, Kaweah, and Tule Rivers with the principal supply from the Kings River. Other surface water available to land-owners in the District is obtained from private canal systems through stock ownership. It is estimated that the average local surface water supply for use on land in the District is 179,000 acre-feet a year.

6. The District does not own any wells, but there are some privately owned wells in the District. The major supply of ground water used in the District, however, is imported from private well fields east of the District. It is estimated that the safe ground water yield for use in the District approximates 75,000 acre-feet a year.

7. The potential requirement for imported water in the District is about 141,000 acre-feet annually.

8. Water from the California Aqueduct can be provided to the District at an estimated equivalent unit rate for annual entitlements of \$16.59 per acre-foot at canalside. The unit rate for surplus water used for agricultural purposes in Kings County is estimated to range from \$3 to \$4 per acre-foot. The equivalent unit rate for delivery of combined entitlement and

surplus water is about \$14.60 per acre-foot over the repayment period.

9. The District has a distribution system which, with some improvements, can be used to distribute water from the California Aqueduct. It was assumed that the District would use three conduits to convey water from the California Aqueduct to the present distribution system. The estimated total cost to convey and distribute the water, including the capital cost and the operation, maintenance, and replacement costs of both the distribution system and the conveyance facility, on an equivalent unit rate basis, is \$3.61 per acre-foot during the project repayment period.

10. Consideration of the payment capacity of crops and the cost of purchase, conveyance, and distribution of water indicates that the economic demand in 1990 in the District is 385,000 acre-feet per year. The economic demand could be supplied as follows: 75,000 acre-feet from ground water, 179,000 acre-feet from surface water and the remainder of 131,000 acre-feet from the State Water Project. The District contracted in December 1963 for a water supply of 110,000 acre-feet annually from the State Water Project.

11. The assessed valuation of lands within the District was about \$8,490,000 based on the 1962-63 assessment. The District's area has a bonded indebtedness of \$248,000 or 2.9 percent of the assessed valuation.

12. The District will not be unduly burdened by its obligation to pay for and distribute the supply of water it will

receive during the project repayment period under its contract with the State.

Conclusions

1. The State of California has the necessary water supply and the authority to enter into the contract with the Tulare Lake Basin Water Storage District, which was signed December 20, 1963, and amended December 30, 1963, and September 28, 1964, for the service of a maximum annual entitlement of 110,000 acre-feet of water.

2. The contractual cost to the District and the cost for conveyance and distribution of the water can be met with agricultural water tolls which would not exceed the ability of users to pay for water.

3. The Tulare Lake Basin Water Storage District has the authority, the necessity, and the financial capability to enter into the contract with the State of California for the service of a maximum annual entitlement of 110,000 acre-feet of water from the State Water Project.

al :		:Previous Year:		:
st :	Net	:Balance Plus	:Interest:	Balance
arm :	Operating:	Net Operating:	at	at End
gate:	Revenue :	Revenue :	4%	of Year
4=15	9-15=16	17	18	17+18=19
		\$ -182,000*		
400	\$ -9,400	-191,400	\$ -7,700	\$-199,100
200	258,400	59,300	2,400	61,700
000	77,200	138,900	5,600	144,500
600	-2,400	142,100	5,700	147,800
600	32,900	180,700	7,200	187,900
100	-144,300	43,600	1,700	45,300
500	380,500	425,800	17,000	442,800
600	293,400	736,200	29,400	765,600
300	505,500	1,271,100	50,800	1,321,900
800	337,000	1,658,900	66,400	1,725,300
500	176,500	1,901,800	76,100	1,977,900
800	357,200	2,335,100	93,400	2,428,500
700	312,300	2,740,800	109,600	2,850,400
300	243,700	3,094,100	123,800	3,217,900
700	3,100	3,221,000	128,800	3,349,800
500	-324,200	3,025,600	121,000	3,146,600
000	-325,500	2,821,100	112,800	2,933,900
100	-325,300	2,608,600	104,300	2,712,900
600	-325,600	2,387,300	95,500	2,482,800
300	-277,300	2,205,500	88,200	2,293,700
700	-291,400	2,002,300	80,100	2,082,400
800	-281,300	1,801,100	72,000	1,873,100
500	-271,700	1,601,400	64,100	1,665,500
600	-244,600	1,420,900	56,800	1,477,700
600	-240,600	1,237,100	49,500	1,286,600
500	-240,500	1,046,100	41,800	1,087,900
400	-240,400	847,500	33,900	881,400
100	-240,100	641,300	25,700	667,000
900	-239,900	427,100	17,100	444,200
900	-129,900	314,300	12,600	326,900
600	-129,600	197,300	7,900	205,200
600	-129,600	75,600	3,000	78,600
500	-78,600	0	0	0
500	0	0	0	0
000	0	0	0	0

TABLE 6
FINANCIAL ANALYSIS
TULARE LAKE BASIN WATER STORAGE DISTRICT

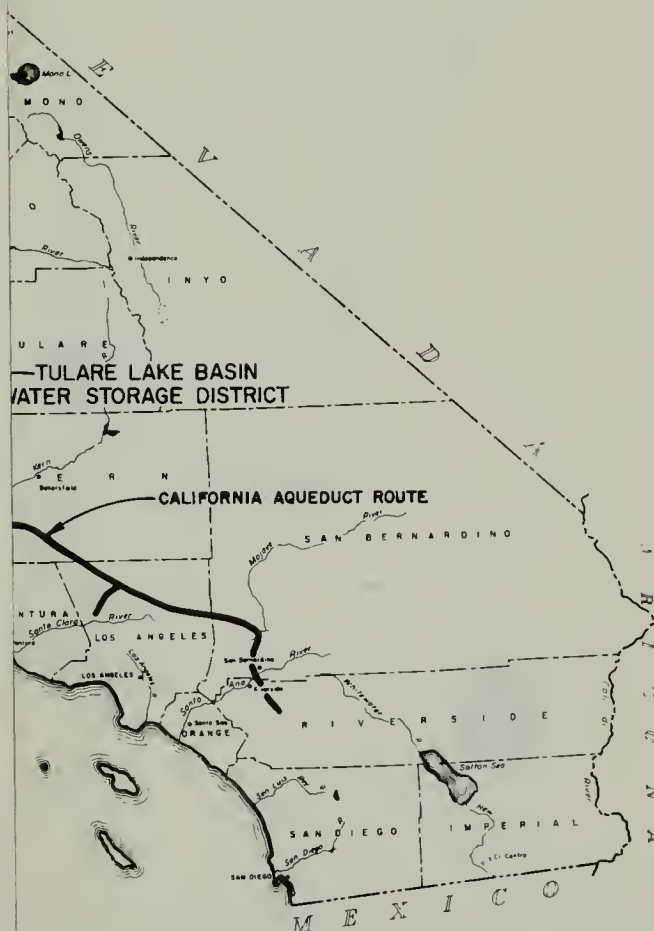
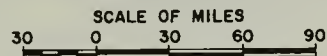
Year	: Annual Water Deliveries :			: Annual Revenues :					: Annual Costs at Canalside :				Total Annual	Total	: Previous Year :				
	: (In acre-feet) :			: Entitlement :		: Surplus :			: Entitlement :		: Surplus :		: Local Distribution:	Cost	Net	: Balance Plus	: Interest:	Balance	
	:	:	:	Per	:	Per	:	Total	:	Per	:	Total	:	and Conveyance	at Farm	: Operating:	: Net Operating:	at	:
	:Entitlement:	:Surplus:	Total	Acre-foot:	Total	Acre-foot:	Total	:	Total	Acre-foot:	Total	:	:	Costs	:Headgate:	Revenue	Revenue	4%	: of Year
1	2	3	2+3=4	5	2x5=6	7	3x7=6	6+8=9	10	11	3x11=12	10+12=13	14	13+14=15	9-15=16	17	18	17+18=19	
1965																			
66									\$ 9,400			\$ 9,400				\$ -182,000*			
67													\$ 9,400	\$ -9,400		-191,400	\$ -7,700	\$ -199,100	
68	26,900	26,900	53,800	\$19.75	\$531,300	\$19.75	\$531,300	\$1,062,600	433,000	\$3.02	\$ 81,200	514,200	\$290,000	804,200	258,400	59,300	2,400	61,700	
69	29,300	14,100	43,400	19.75	578,700	19.75	278,500	857,200	449,900	3.76	53,000	502,900	277,100	780,000	77,200	138,900	5,600	144,500	
1970	31,800	11,400	43,200	19.75	628,100	19.75	225,100	853,200	535,500	3.80	43,300	578,800	276,800	855,600	-2,400	142,100	5,700	147,800	
71	34,200	12,000	46,200	19.75	675,500	19.75	237,000	912,500	552,700	3.86	46,300	599,000	280,600	879,600	32,900	180,700	7,200	187,900	
72	36,700	0	36,700	19.75	724,800	-	0	724,800	600,400	-	0	600,400	268,700	869,100	-144,300	43,600	1,700	45,300	
73	39,100	44,900	84,000	17.50	684,300	17.50	785,700	1,470,000	631,500	2.90	130,200	761,700	327,800	1,089,500	380,500	425,800	17,000	442,800	
74	43,000	37,800	80,800	17.50	752,500	17.50	661,500	1,414,000	685,700	2.94	111,100	796,800	323,800	1,120,600	293,400	736,200	29,400	765,600	
1975	46,900	54,000	100,900	17.50	820,800	17.50	945,000	1,765,800	740,100	3.17	171,200	911,300	349,000	1,260,300	505,500	1,271,100	50,800	1,321,900	
76	50,800	40,900	91,700	17.50	889,000	17.50	715,800	1,604,800	805,700	3.05	124,700	930,400	337,400	1,267,800	337,000	1,658,900	66,400	1,725,300	
77	54,800	28,400	83,200	17.50	959,000	17.50	497,000	1,456,000	861,500	3.21	91,200	952,700	326,800	1,279,500	176,500	1,901,800	76,100	1,977,900	
78	58,700	51,300	110,000	17.50	1,027,300	17.50	897,700	1,925,000	1,034,600	3.37	172,900	1,207,500	360,300	1,567,800	357,200	2,335,100	93,400	2,428,500	
79	62,600	47,400	110,000	17.50	1,095,500	17.50	829,500	1,925,000	1,097,400	3.27	155,000	1,252,400	360,300	1,612,700	312,300	2,740,800	109,600	2,850,400	
1980	66,500	43,500	110,000	17.50	1,163,800	17.50	761,200	1,925,000	1,175,300	3.35	145,700	1,321,000	360,300	1,681,300	243,700	3,094,100	123,800	3,217,900	
81	70,400	24,900	95,300	17.50	1,232,000	17.50	435,800	1,667,800	1,237,400	3.43	85,400	1,322,800	341,900	1,664,700	3,100	3,221,000	128,800	3,349,800	
82	74,300		74,300	17.50	1,300,300			1,300,300	1,308,900			1,308,900	315,600	1,624,500	-324,200	3,025,600	121,000	3,146,600	
83	78,200		78,200	17.50	1,368,500			1,368,500	1,373,400			1,373,400	320,600	1,694,000	-325,500	2,821,100	112,800	2,933,900	
84	82,100		82,100	17.50	1,436,800			1,436,800	1,436,700			1,436,700	325,400	1,762,100	-325,300	2,608,600	104,300	2,712,900	
1985	86,000		86,000	17.50	1,505,000			1,505,000	1,500,300			1,500,300	330,300	1,830,600	-325,600	2,387,300	95,500	2,482,800	
86	90,000		90,000	17.50	1,575,000			1,575,000	1,517,000			1,517,000	335,300	1,852,300	-277,300	2,205,500	88,200	2,293,700	
87	93,900		93,900	17.50	1,643,300			1,643,300	1,594,500			1,594,500	340,200	1,934,700	-291,400	2,002,300	80,100	2,082,400	
88	97,800		97,800	17.50	1,711,500			1,711,500	1,647,700			1,647,700	345,100	1,992,800	-281,300	1,801,100	72,000	1,873,100	
89	101,700		101,700	17.50	1,779,800			1,779,800	1,701,500			1,701,500	350,000	2,051,500	-271,700	1,601,400	64,100	1,665,500	
1990	110,000		110,000	17.50	1,925,000			1,925,000	1,809,300			1,809,300	360,300	2,169,600	-244,600	1,420,900	56,800	1,477,700	
91	110,000		110,000	17.50	1,925,000			1,925,000	1,805,300			1,805,300	360,300	2,165,600	-240,600	1,237,100	49,500	1,286,600	
92	110,000		110,000	17.50	1,925,000			1,925,000	1,805,200			1,805,200	360,300	2,165,500	-240,500	1,046,100	41,800	1,087,900	
93	110,000		110,000	17.50	1,925,000			1,925,000	1,805,100			1,805,100	360,300	2,165,400	-240,400	847,500	33,900	881,400	
94	110,000		110,000	17.50	1,925,000			1,925,000	1,804,800			1,804,800	360,300	2,165,100	-240,100	641,300	25,700	667,000	
1995	110,000		110,000	17.50	1,925,000			1,925,000	1,804,600			1,804,600	360,300	2,164,900	-239,900	427,100	17,100	444,200	
96	110,000		110,000	18.50	2,035,000			2,035,000	1,804,600			1,804,600	360,300	2,164,900	-129,900	314,300	12,600	326,900	
97	110,000		110,000	18.50	2,035,000			2,035,000	1,804,300			1,804,300	360,300	2,164,600	-129,600	197,300	7,900	205,200	
98	110,000		110,000	18.50	2,035,000			2,035,000	1,804,300			1,804,300	360,300	2,164,600	-129,600	75,600	3,000	78,600	
99	110,000		110,000	18.96	2,085,900			2,085,900	1,804,200			1,804,200	360,300	2,164,500	-78,600	0	0	0	
2000-2007	110,000		110,000	19.68	2,164,500			2,164,500	1,804,200			1,804,200	360,300	2,164,500	0	0	0	0	
2008-2035	110,000		110,000	17.97	1,977,000			1,977,000	1,804,200			1,804,200	172,800	1,977,000	0	0	0	0	

*Lump sum for turnout structures.

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FEASIBILITY OF SERVING THE TULARE LAKE BASIN WATER
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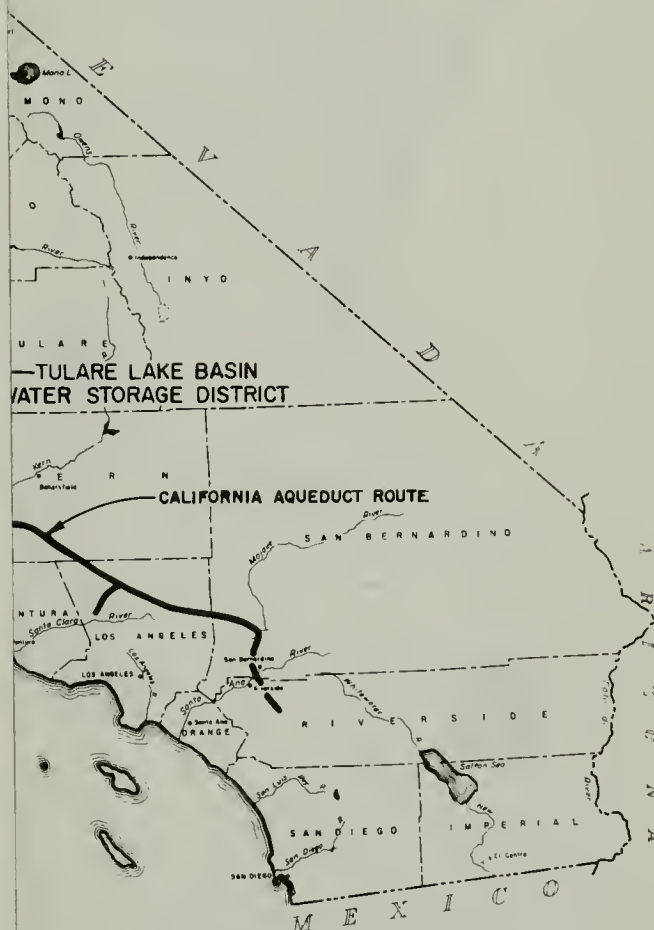
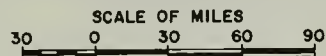
LOCATION OF
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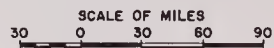
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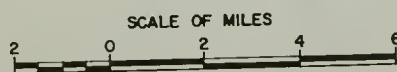


LEGEND


 TULARE LAKE BASIN WATER STORAGE
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ABILITY OF SERVING THE TULARE LAKE BASIN WATER
STORAGE DISTRICT FROM THE STATE WATER PROJECT
TULARE LAKE BASIN WATER STORAGE DISTRICT
1964

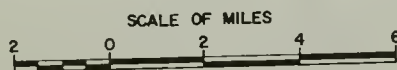


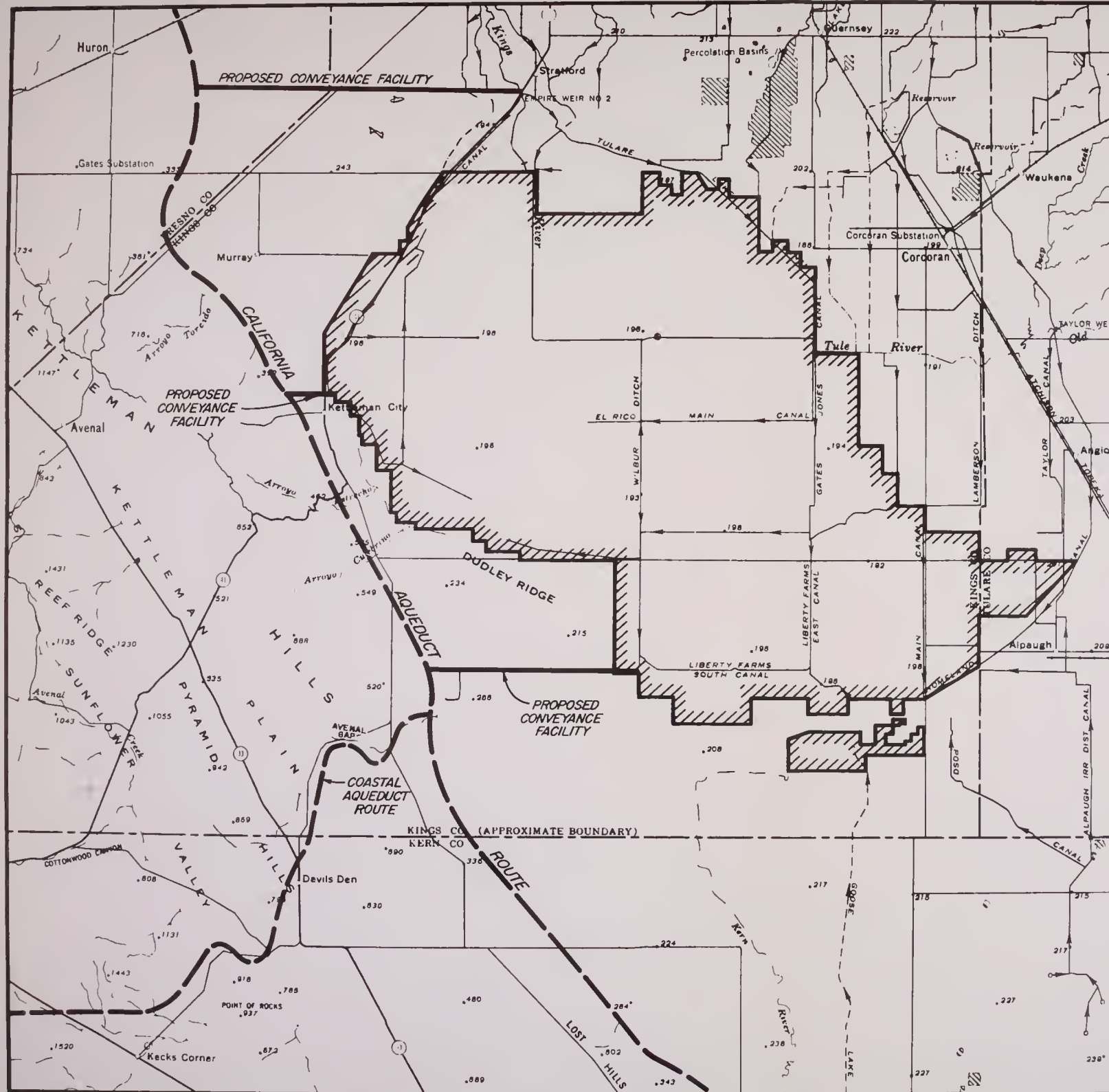
LEGEND

 TULARE LAKE BASIN WATER STORAGE
DISTRICT BOUNDARY

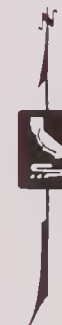


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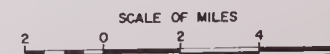


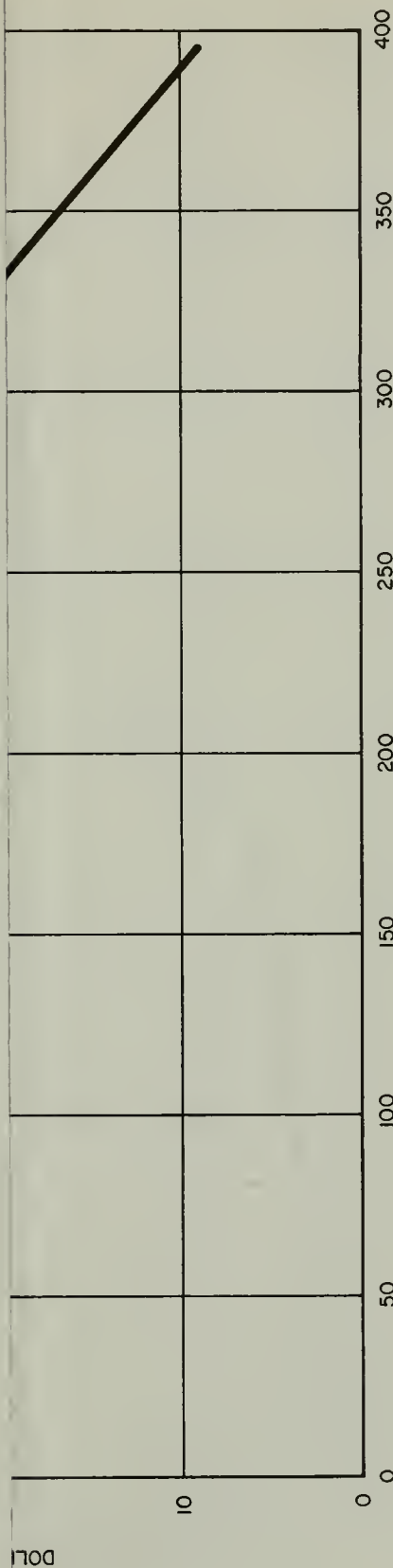


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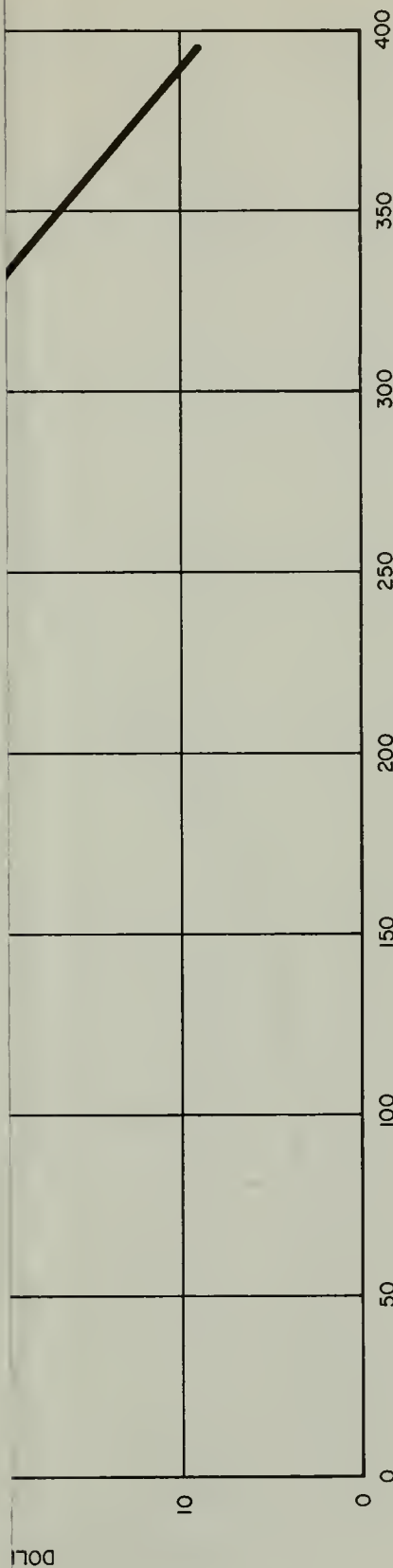


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TULARE LAKE BASIN WATER STORAGE DISTRICT
 1964

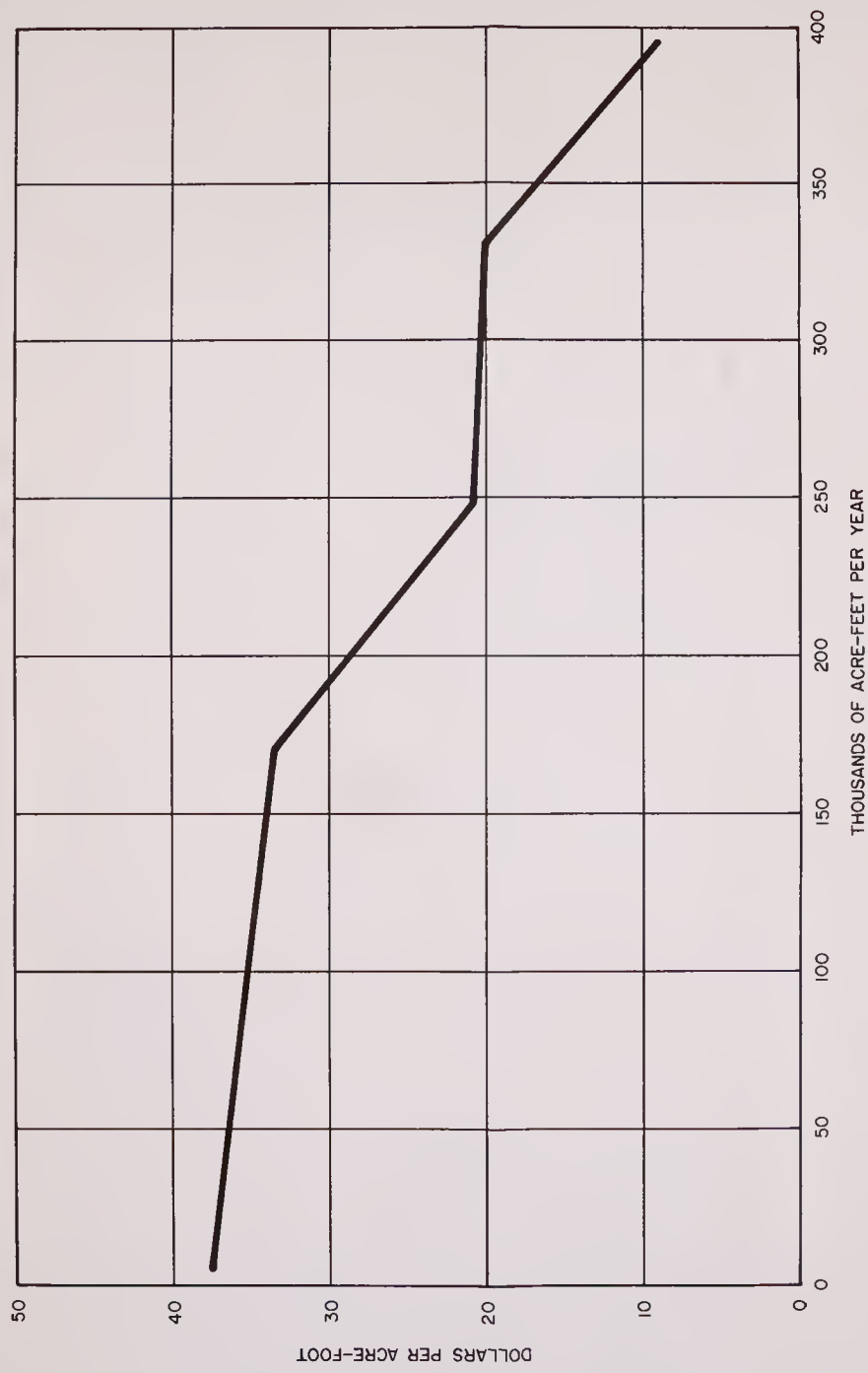




WATER COST-DEMAND CURVE
FOR
TULARE LAKE BASIN WATER STORAGE DISTRICT



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